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Thinnings

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THINNINGS may be considered the playthings of the forester, the essence of silviculture and the touchstone of economic forest practice. The abundant young forests, east and west, both in the United States and Canada, offer well-nigh unlimited opportunities for thinnings today. Records of varied and interesting stand improvements are available mainly through the pages of the Journal of Forestry.

Most of the thinnings on record are in the nature of experiments, and all but a very few have been confined to evergreen stands. Foresters here and there have expressed their eagerness to begin this important phase of real forestry practice. In some cases thinnings have been begun as a part of research projects carried on by one or another of the forest experiment stations. However, very few records from these have so far been published.

Encouraging beginnings, to be sure, but we have by no means passed the preliminary experimental stage whereby we hope to formulate plans and crystallize methods for extended and continuous thinning practices in the far-flung forest regions of the country.

IT IS the author's impression that in the earlier installations of thinning plots, like those in eastern white pine, southern white cedar, and southern pines, we have followed too closely or too literally the European methods, particularly the Swedish system of thinning from below. Also, too much emphasis has been placed upon the cost and the immediate or very early response in growth, with insufficient attention given to form, rate of growth, quality of the wood, the products obtainable, or the effect upon the remaining trees or the site itself. This would be the natural trend in quasi- or semi-scientific investigations, if we may use such terms.

Of course, if the attention is focused entirely upon the costs

and ensuing financial returns rather than results enumerated above, no arguments would be accepted. The only conditions which must then be satisfied would be that the trees exist in sufficient number and size for easy sale at locations not too far removed from the place of utilization. The chosen tree method, or spot thinning, by which certain promising trees are liberated from competition, is justified on economic grounds only and is also experimental; what the results will be along more technical lines, no one knows. It is rather surprising that an unproved process has found such general and unreserved application.

Grade B or medium thinning from below. Western White Pine, Kaniksu National Forest, Idaho.

IF THINNINGS are made in the interest of research, we face an entirely different situation, and the particulars which should then be weighed and studied are: the proper time to begin in stands of varying age, density, and site conditions; the spacing in relation to growth, pruning, stem form and development; the pick-up by trees of different crown classes; the grades, or systems, of thinnings applicable to tolerant or to intolerant

trees or to mixtures; and finally, the future object of management, or what we wish to produce as an intermediate as well as a final crop. Most certainly the degree of thinnings must be made to serve these purposes in a very significant way.

It is evident that there is a wide variation as to the time thinnings should begin in the young stands, especially with respect to tolerant or intolerant species, and natural stands or plantations. In order to clarify the issue we should agree upon four periods for treatment of immature forests: the first period when the age is less than 15 years; the second when from 15 to 30 years; the third from 30 up to 45 years; and the fourth reaching from 45 to 60 years.

GENERALLY, thinnings which are made during the first of these periods have the greatest influence in shaping future form of the trees. Thinnings made during the second interim entail considerable labor cost, but are perhaps the most productive of results. It is the plastic youthful period in the life of trees generally. At this time the removable material is seldom salable. During the third period every thinning should pay its own way. Thinnings which are begun during the fourth period might in most cases involve removal of a proportion of the larger or dominant trees in order to insure adequate returns.

It is beginning to be recognized that in natural stands the thinning out of the lower crown classes results in very little increment of the remaining trees, and that thinnings from below among very tolerant species yield very small material even during the second period. For very intolerant species, on the other hand, the third period is ordinarily too late to begin. (3) Naturally-grown young forests are almost invariably denser than the planted; for this reason the former are available for experimental thinnings at a much earlier age than trees in plantations. A low form of thinning might work best in a forest of purely intolerant species or one composed entirely of tolerant trees, while a high form, or crown thinning, would be applicable to intolerants over tolerants.

In thinning operations more attention could well be given to the size of the crown in relation to future growth or pick-up after the treatment. Randals (6) has thinned western yellow pine in the Southwest. Though the products are unsalable, his work is of great interest in showing the response in growth according to definite crown classes. This strikes a new note in thinning research and points the way to more careful planning in these studies and more intelligent interpretation of the re-

sults. The crown classes designated as good showed, after five years, a diameter growth up to 0.83 inches; those designated fair, up to 0.48 inches; and those called poor not more than 0.31 inches.

COLOR is lent to this classification by the recent crown designations proposed by Craib (2) and Chalk (1). In close measurements of three trees of Douglas fir of the same age and growing on the same site, Chalk found that in the dominant tree with a crown length of 18¾ feet, wood of the outer four rings indicated a weight of 6,500 grams per unit used; in the medium tree, with crown length of 16⅓ feet, the wood produced in the outer four rings weighed 4,426 grams, and in the suppressed tree, where the crown length was 8 feet, the wood weighed only 2,839 grams. These are comparative figures. When all of the needles from these trees were stripped, their oven-dry weight lined up in the following order: 6.4 grams, 2.0 grams, and 1.0 grams. (Reducing the last to 1.0.)

The system ordinarily used in classifying trees on the thinning plots should be carefully chosen. It is customary to place them in crown classes according to dominance and give some further key to the form or condition of the stem. The first part of this attempted crown classification is rather inadequate. It provides no means of expressing vigor, vitality, or ability to pick up after liberation. Craib (2) has recently proposed a new and complete scheme for rating the trees, in thinning practice, the essential basis being that of crown vigor. After all, whatever has happened or happens in the future to a tree, its rate of growth after thinning will be determined mainly by size of crown and the pick-up by its vigor.

THREE major classes, A, B, and C, are proposed. In class A are tolerant trees which are capable of developing full, deep, and long crowns. In class B are those of medium tolerance, and in class C would fall the intolerant species. The trees falling within any one of these three main classes are further rated from 10 to 1, according to the length of the crowns on the stem. Those rated 10 have the greatest possible long and full crowns and those rated 1 have the thin, short tufts at the upper part of a spindly, whip-like stem. Furthermore, each of the three major divisions, A, B, and C, may be rated according to the density of the foliage.

This may seem like unnecessary refinement, but it is obvious that a scale to be of use must provide for all possible classes,

just as in a library all manner of books must be filed with ease without unduly straining the system. For intolerant trees, there would perhaps not be a call for as many subdivisions as for tolerant species.

Spacing is another matter which claims our consideration. Which is to be preferred; laxity in regular spacing, with careful attention to individual trees regardless of their position with respect to others, or more or less regular spacing, thereby sacrificing certain promising trees? Three plots laid out in Coast Douglas fir at Wind River, Washington, 1919, have been written up by Meyers (4). The guiding principle in these was to leave the trees at a definite spacing, regardless of kind. These showed an increase since 1919 up to two feet in height per year for thinned series and only 1.4 for the unthinned. It was concluded that a regular-spaced thinning in which any species of trees are left has no advantage over one where the more advanced trees are reserved regardless of spacing. That is, a lax or approximate spacing where the better trees are left has much merit.

There has been considerable discussion as to what degree of

Grade C or heavy thinning, Western White Pine, showing space left between crowns.

thinning will result in the strongest or most usable wood. A rapid rate of growth is not always to be preferred. In evergreens, a medium and uniform rate is best; in ring porous species a rapid growth creates the heaviest and strongest wood and yet, withal, a respectable degree of pruning and height growth must be the rule. In diffuse porous hardwoods rate of diameter growth has little influence on the quality of the product.

In order to thin with discretion, we should know something about normality. What criteria shall be used in judging normality? How would a forester ever obtain absolute proof of this except from the scrutiny of stands thinned in varying degrees? Stem analysis may be going out of use in mensuration generally, but it must be revived in the study of form and rate of growth produced by thinnings. W. H. Meyer and Schumacher (5) have made valuable beginnings in this field. For Douglas fir, age 40 to 45 years, a normality of 80 percent on the basis of total cubic volume will increase at the rate of 4 percent in a five-year period. When, however, normality reaches 106 percent, it will increase at the slow rate of 1 percent. It would come to a balance or complete standstill when at 110 to 115 percent. The approach to normal varies with species, spacing and site quality. It will give the silviculturist and the mensuration specialist much mental exercise.

It appears that we have yet some distance to cover in perfecting our thinning studies and practices before we will feel the ground firmly under our feet or before we have assurance that we follow the right track. At any rate, we have made a brave start. What we need is the most painstaking planning before more installations are made, and a masterly analysis of measurements when they become available.

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